

# Tulsa Tornado Tribune



Where People Who Know the Weather Get Their Weather

National Weather Service Tulsa, Oklahoma

Fall 2011

Craig Sullivan - Editor

Wednesday, September 28, 2011

## WHAT NEXT?

**T**his is getting out of hand! First came the record shattering snowfall and cold of February, followed by a historic flood in the middle of a record tornado season (see related stories below and on page nine). After all that, you had to think that summer couldn't be THAT bad, could it?

Well, you would be wrong! The summer of 2011 was that bad... arguably the worst in a generation or more! The climatological summer (June through August) will go into the record books as the hottest

ever for many locations across eastern Oklahoma and northwest Arkansas. Fort Smith, McAlester and Fayetteville all saw the hottest summer ever, while Tulsa officially finished 2011 with the second hottest summer on record. For the entire state of Oklahoma, 2011 will be recorded as the hottest ever.

*Stories about the summer heat can be found on Pages 2, 7 and 8.*

### ALL-TIME RECORDS ESTABLISHED THIS SUMMER

#### Tulsa

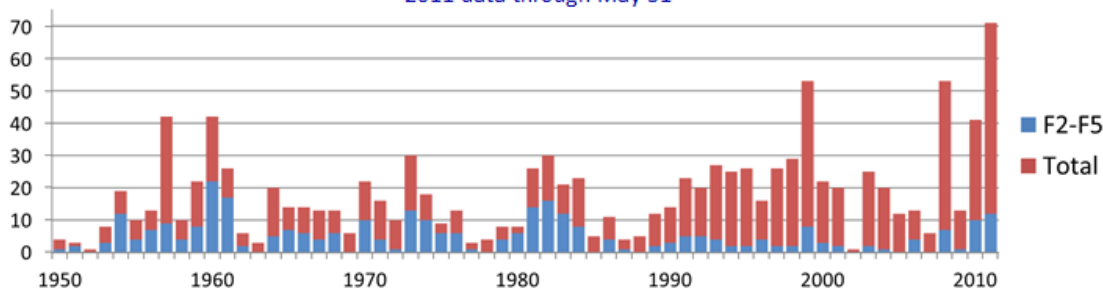
- Hottest June Average Temperature -
- Hottest June through July Average Temperature -
- Most June days 90 degrees or above - 29
- Highest daily minimum temperature (tied) - 87 (8/2)

#### Fort Smith

- Hottest Summer (June - August) Average Temperature
- Hottest Average Temperature for ANY month - July
- Most June days 90 degrees or above - 30
- Most July days 100 degrees or above - 30
- Most consecutive days at or above 100 - 35 (7/5 - 8/8)
- Highest daily maximum temperature - 115 (8/3)

## RECORD TORNADO SEASON

Tulsa CWA Tornadoes 1950-2011\*  
\*2011 data through May 31



**W**hile the attention recently has shifted squarely onto heat and drought, it was only a few short months ago that we were breaking other records...specifically the number of tornadoes in eastern Oklahoma and northwest Arkansas. Through the end of May, a record 71 tornadoes had been confirmed in

the NWS Tulsa forecast area, exceeding the record set just three years earlier. Three events defined the season: a 24 hour record for the area, a deadly EF-4, and, for our neighbors to the northeast, the deadliest tornado in over 50 years.

*Details on pages 3 - 7.*



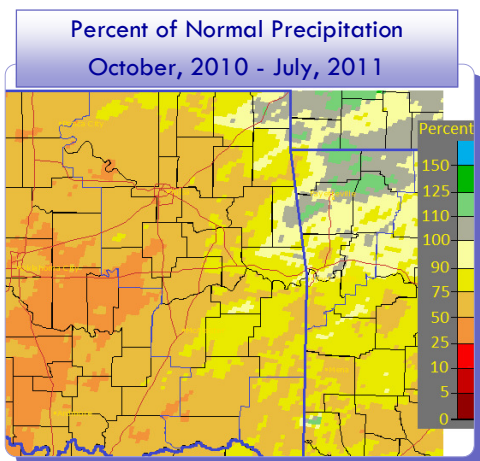
Tornado over Grand Lake - May 22, 2011

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## SUMMER, 2011 ARRIVES EARLY

*Dry conditions and record heat led to extreme drought conditions by the end of July.*

**B**y the end of May, most of the NWS Tulsa forecast area was at least in decent shape in terms of moisture. While the heavy rainfall of April and May (Fort Smith actually saw its sixth wettest spring on record) had alleviated drought conditions over western Arkansas and most of eastern Oklahoma, some areas to the west of U.S. Highway 75 were still abnormally dry, and extreme to exceptional drought conditions raged across western Oklahoma.



Despite heavy spring rain and winter snowfall in some areas, virtually all of eastern Oklahoma and west central Arkansas have seen long term precipitation deficits. Above is the percent of normal precipitation for the "Water Year" (October 1 to September 30) as of late July. Those areas receiving less than 50 percent of normal for the period correspond closely to the extreme drought areas.

While June is the beginning of meteorological summer, for our area, it is really a month of transition to the hot summer months of July and August, and is the second wettest month of the year on average. The active upper level pattern of late May very quickly gave way to a large, sprawling upper level ridge of high pressure over the southern United States by the first week of June. The ridge simply refused to budge after that... in other words, summer was on!

The upper high kept any significant systems from impacting the region throughout June. Thus, June 2011 brought a shift back to well below normal precipitation. Most of eastern Oklahoma and northwest Arkansas received only 10 to 50 percent of normal June rainfall...some areas of southeast and east central Oklahoma actually received less than 5 percent! By the end of the month, moderate drought conditions had crept back across much of eastern Oklahoma west of U.S. 75.

The heat continued to build through the month as well. Temperatures more fitting of July were the norm for most of the month...with several daily record highs established. Every day in June 2011 reached 90 degrees or higher in Fort Smith...obviously a record (the previous record was 29 days in 1953). Tulsa tied its record of 29 days of 90 degrees plus (previously occurred in 1934 and 1911). Both locations average about 14 days above 90 degrees in June. As a result, Fort Smith saw its warmest June on record, while Tulsa saw its second warmest.



A large grass fire rages near Greenwood, Arkansas on July 28. The extreme heat and drought conditions cured vegetation to an almost winter-like state over much of the area by mid summer. The fire was started by kids playing with fireworks, and burned over 1000 acres at Fort Chaffee. One home was destroyed and several others damaged.

What started in June only got worse in July as the stubborn upper high stayed put, bringing more hot, dry weather. Significant rainfall events were few and far between, not to mention very localized. Temperatures just got hotter...as one would expect in July...with day after day of triple digit heat. As July wore on, it was becoming apparent that this was going to be a historic summer, in terms of heat and drought.

Fort Smith topped 100 degrees on all but one day in July, helping sew up their hottest calendar month on record. Fort Smith also appeared to be on its way to breaking the record for driest July, until a thunderstorm on the 28th "spoiled" that honor. Tulsa saw its second hottest July, trailing only the infamous summer of 1980.

**Summer** continues on page 7

# Spring, 2011 Tornado Outbreaks

## APRIL 14 - A NEW RECORD

The first real severe weather outbreak of the spring turned out to be a record-breaking one. A strong low pressure system moved out of the Rockies and into the Southern Plains on the afternoon of April 14. A surface low deepened across central Kansas by early afternoon, with a sharp dryline extending southward near I-35. In the upper levels, a strong westerly upper-level jet was also present across northern Texas, which helped to further enhance the severity of the storms. Initial storms fired along the dryline from near Ponca City to Ardmore at around 3 pm. These storms quickly matured into supercells as they moved into eastern Oklahoma due to favorable wind profiles and strong instability. Storms continued to increase as the dryline slowly moved east during the evening. A trailing cold front overtook the dryline during the late evening hours, leading to additional development and a line of storms across western Arkansas.



EF-2 tornado damage near Euchea, OK April 14, 2011.

The storms were responsible for 25 confirmed tornadoes...a new daily record for the NWS Tulsa forecast area! In addition, there were several

reports of hail to the size of golf balls, and a couple of reports of softball size hail in southeast Oklahoma.

Although there were no fatalities in the Tulsa forecast area, a strong (EF3) tornado killed two in the town of Tushka, OK (Atoka County). The same supercell responsible for that tornado eventually tracked across Pushmataha County, where a total of eight tornadoes touched down. A total of eight injuries were reported in the Tulsa forecast area. The majority of the tornadoes were "weak" (EF0-EF1) and short lived, with only three of the tornadoes rated EF2.

## MAY 22 - JOPLIN

A dryline extended from south-east Kansas into south-west Oklahoma on the afternoon of May 22. An extremely unstable air-

mass, with CAPE values near 5000 j/kg, was in place ahead of the dryline across eastern Oklahoma and north-west Arkansas. Several thunderstorms developed along the boundary across northeast Oklahoma by early evening, with more isolated convection occurring further south. These storms quickly evolved into rotating supercells that produced large hail, wind damage, and 12 tornadoes as they tracked east across eastern Oklahoma and northwest Arkansas.



Tornado near Zena, OK, May 22, 2011

Photo by Ashley Hampton



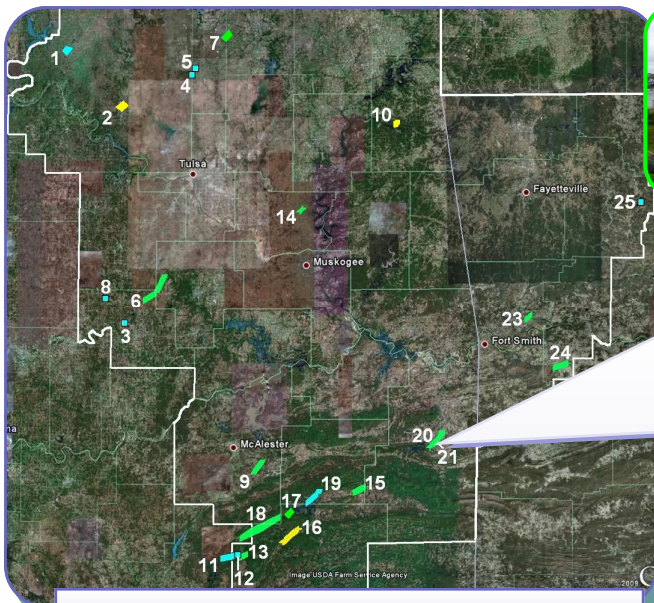
Golf ball to tennis ball size hail fell at the NWS Tulsa office on May 22. The hailstone in this photo measured near 3 inches at its widest point.

The strongest tornado of the evening tracked from near Zena to south of Grove in Delaware County, OK, and was rated EF-3. The most significant damage occurred as the tornado approached the Missouri border. Two double-wide manufactured homes were destroyed, a permanent home was severely damaged, barns and outbuildings were destroyed, and a number of other homes were damaged. Hundreds of trees were snapped or uprooted, and many power poles were snapped along the path of the tornado. Two injuries were reported.

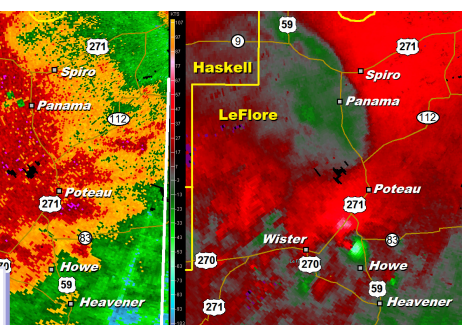
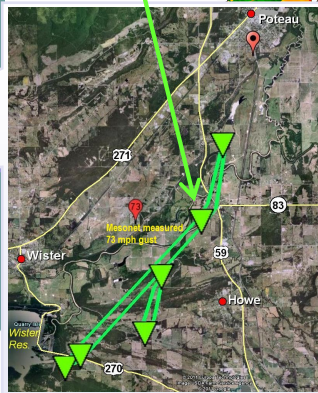
Another strong (EF-2) tornado west of West Siloam Springs, OK injured 12 people as it tore through a mobile home park and destroyed six mobile homes. The south Grand Lake area was also hit hard by a strong (EF-2) tornado, with several homes severely damaged, seven mobile homes destroyed, and a number of boat docks destroyed. Finally, another EF-2 tornado severely damaged homes in the Fiddlers Bend area on the Illinois River, which only one month prior experienced record flooding.

## April 14, 2011 Confirmed Tornadoes

	Time	County	Location	Length	Width	Max Wind	Remarks
1)	412 pm	Osage	1.6 ENE Burbank - 1.9 NE Burbank	0.4 mi	40 yd	75 mph	Tree damage
2)	500 pm	Osage	2.6 N Hominy - 3.4 NE Hominy	1 mi	275 yd	115 mph	Permanent home, metal building damaged, power poles snapped
3)	538 pm	Okfuskee	4 SSW Welty	0.2 mi	50 yd	unk	Spotter reported, no known damage
4)	539 pm	Washington	1 W Ochelata	0.1 mi	50 yd	unk	Media reported, open country
5)	544 pm	Washington	2 N Ochelata	0.1 mi	50 yd	unk	Emergency Management reported, open country
6)	605 pm	Okfuskee/ Okmulgee	0.5 S Haydenville - 3.9 N Nuyaka	11.4 mi	100 yd	105 mph	Trees snapped/uprooted
7)	611 pm	Washington/ Nowata	7.2 ESE Dewey - 8.5 W Delaware	1.6 mi	200 yd	105 mph	Several permanent homes damaged, trees snapped/uprooted
8)	633 pm	Okfuskee	1.5 NE Castle	0.1 mi	50 yd	unk	Media reported, no known damage
9)	714 pm	Pittsburg	5.9 S Bache - 2.2 SE Bache	5.5 mi	300 yd	105 mph	Trees snapped/uprooted
10)	747 pm	Delaware	1.4 SSE Eucha - 1.3 SE Eucha	0.5 mi	100 yd	125 mph	<b>3 Injured</b> ; Mobile homes damaged/destroyed
11)	810 pm	Pushmataha	2.5 W Jumbo - 1.5 WNW Jumbo	1 mi	125 yd	unk	Spotter reported, no known damage
12)	812 pm	Pushmataha	1 NW Jumbo	0.1 mi	50 yd	unk	Spotter reported, no known damage
13)	812 pm	Pushmataha	0.5 WSW Jumbo - 2.6 ENE Jumbo	3 mi	400 yd	100 mph	Trees snapped/uprooted
14)	818 pm	Wagoner	2.8 NW Wagoner - 3.1 NNW Wagoner	1.8 mi	290 yd	110 mph	Homes damaged, trees snapped/uprooted
15)	828 pm	Latimer/ LeFlore	4.6 WSW Talihina - 0.5 NNW Talihina	4.6 mi	600 yd	110 mph	Home and barn damaged, trees snapped/uprooted
16)	835 pm	Pushmataha	10.5 SW Clayton - 3.7 WSW Clayton	7 mi	1000 yd	115 mph	Numerous trees snapped/uprooted
17)	850 pm	Pushmataha	7.5 NW Clayton - 7.1 NW Clayton	1 mi	75 yd	90 mph	Trees downed
18)	903 pm	Pushmataha/ Pittsburg	4.8 WSW Adel - 4.5 SE Weathers	10.2 mi	1100 yd	105 mph	Numerous trees snapped/uprooted
19)	908 pm	Latimer	4 WSW Yanush - 2.4 NNE Yanush	6 mi	500 yd	85 mph	Trees uprooted, large branches snapped
20)	923 pm	LeFlore	2.9 SSE Wister - 3.2 S Poteau	7 mi	440 yd	105 mph	<b>3 Injured</b> ; Mobile home rolled, roof damage on home, trees snapped
21)	935 pm	LeFlore	2.1 WSW Howe - 1.7 NW Howe	1.5 mi	300 yd	100 mph	Anticyclonic tornado; Barn damaged, trees snapped/uprooted
22)	1010 pm	Sebastian	4.5 SW Hartford - 4 SW Hartford	0.5 mi	150 yd	95 mph	Large barn destroyed, trees uprooted
23)	1035 pm	Crawford	2.3 W Dyer - 1.6 N Dyer	3 mi	250 yd	100 mph	Two permanent homes damaged, trees snapped/uprooted
24)	1108 pm	Franklin	1.6 SSE Charleston - 1 SE Branch	4.8 mi	350 yd	105 mph	<b>2 Injured</b> ; Trailer rolled, roof damage on permanent homes
25)	1210 am	Madison	3 S Kingston - 2.7 S Kingston	0.5 mi	100 yd	95 mph	Home damaged, trees uprooted



April 14, 2011 Surveyed Tornado Tracks



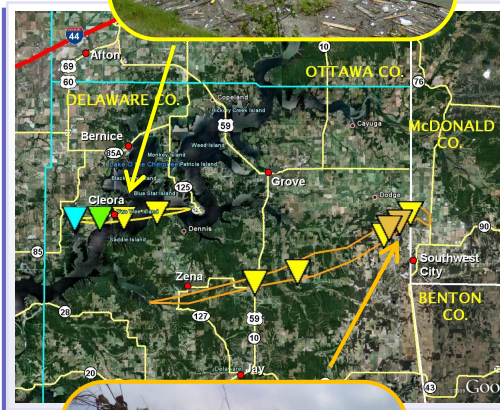
Tornadoes 20 and 21 were both associated with the same supercell storm (reflectivity image above). Tornado 21 was actually *anticyclonic* and caused damage comparable to the cyclonic tornado. The EF-1 damage to the home pictured above occurred near the location of the strong mesocyclone in the Storm-Relative Velocity image above.

## May 22, 2011 Confirmed Tornadoes

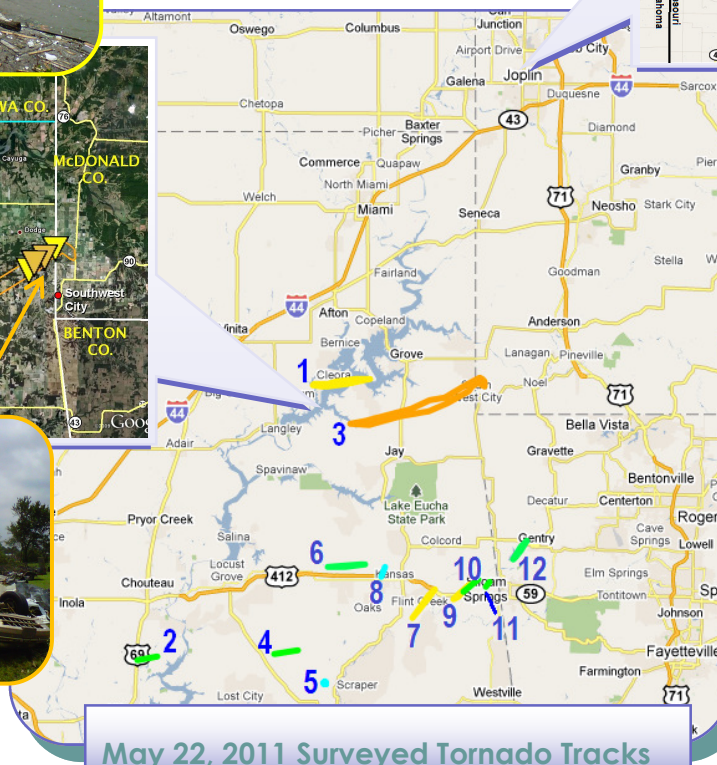
	Time	County	Location	Length	Width	Max Wind	Remarks
1)	633 pm	Delaware	1.8 S Cleora - 5.6 SW Grove	6.7 mi	800 yd	130 mph	Several permanent homes severely damaged, mobile home rolled, significant tree damage
2)	642 pm	Wagoner	6.9 N Wagoner - 8 NNE Wagoner	3.5 mi	300 yd	105 mph	Trees snapped and uprooted
3)	652 pm	Delaware	2.5 WSW Zena - 8.7 ESE Grove	16.5 mi	1550 yd	140 mph	<b>2 Injured</b> ; Several double-wide mobile homes destroyed, permanent homes severely damaged (continued into McDonald Co, MO)
4)	727 pm	Cherokee	2.1 ESE Peggs - 5 E Peggs	3 mi	250 yd	110 mph	Mobile home destroyed, trees snapped/uprooted
5)	750 pm	Cherokee	3.2 W Scraper	0.1 mi	50 yd	unk	Chaser reported, no known damage
6)	813 pm	Delaware	2.1 NW Leach - 1.9 N Twin Oaks	4.7 mi	400 yd	105 mph	Trees snapped/uprooted, Barns damaged
7)	814 pm	Adair/ Delaware	2.5 N Chewey - 5.2 E Kansas	4.5 mi	200 yd	115 mph	Several homes severely damaged, tree snapped/uprooted
8)	829 pm	Delaware	1 NNE Twin Oaks - 2 NW Kansas	1 mi	100 yd	unk	Spotter reported, no known damage
9)	830 pm	Delaware	5.3 W West Siloam Springs - 3.6 NW West Siloam Springs	2.9 mi	350 yd	125 mph	<b>12 Injured</b> ; Six mobile homes destroyed, trees snapped/uprooted
10)	836 pm	Delaware	3.9 WNW West Siloam Springs - 2.9 NW West Siloam Springs	1.7 mi	150 yd	105 mph	Trees snapped
11)	844 pm	Delaware	1.7 NW West Siloam Springs - 1.9 NNW West Siloam Springs	0.5 miles	100 yd	100 mph	Trees snapped
12)	854 pm	Benton	3.2 SW Gentry - 1.3 NW Gentry	2.8 mi	450 yd	105 mph	Trees snapped/uprooted, Barns damaged



Left: Damaged home near Grand Lake (background), with debris in the lake (foreground)



Above: Damage in far eastern Delaware County



May 22, 2011 Surveyed Tornado Tracks

Of course, the attention that evening turned to our northeast, as a devastating EF-5 tornado ripped through the city of Joplin, MO (see track inset above). This became the deadliest single tornado in the United States since modern record keeping began in 1950, with a death toll of 162 people reported as of Sep. 16, 2011, and the seventh deadliest in U.S. history.

Details can be found at the NWS Springfield, MO website. ⚡

## May 24, 2011 Confirmed Tornadoes

Time	County	Location	Length	Width	Max Wind	Remarks
1) 644 pm	Osage	10.3 W Hominy - 8.9 WNW Hominy	2.8 mi	440 yd	95 mph	Trees uprooted, large limbs snapped
2) 649 pm	Osage	10.6 NW Hominy - 4.8 W Pawhuska	17 mi	750 yd	115 mph	Trees uprooted/snapped, power poles snapped
3) 842 pm	Muskogee/ Wagoner	5.5 SW Haskell - 2.2 SSW Redbird	10.2 mi	400 yd	125 mph	Mobile home and barn destroyed, permanent homes damaged, trees uprooted/snapped, power poles snapped
4) 913 pm	Wagoner	1.3 SSW Wagoner - 4 E Wagoner	4.4 mi	450 yd	115 mph	Mobile home destroyed, several permanent homes damaged, many RVs damaged/destroyed
5) 948 pm	Delaware	2.3 NW Leach - 5 NNW Kansas	7 mi	150 yd	95 mph	Trees uprooted, large limbs snapped
6) 950 pm	Latimer	5 N Panola - 7 NNE Panola	2.5 mi	300 yd	105 mph	Trees uprooted/snapped
7) 1006 pm	Delaware	3.7 W Colcord - 4.6 N Colcord	6 mi	150 yd	95 mph	Trees uprooted, large limbs snapped
8) 1014 pm	LeFlore	4 S Talihina - 3.8 SE Talihina	1.5 mi	100 yd	unk	Chaser reported; no known damage
9) 1044 pm	LeFlore	5.3 W Hodgen - 2.2 NE Howe	12 mi	1760 yd	115 mph	Mobile home destroyed, several permanent homes damaged, trees uprooted/snapped
10) 1137 pm	Sequoyah/ Crawford	3.4 ENE Roland - 1.5 SW Rena	5.2 mi	800 yd	105 mph	Trees uprooted/snapped, barn destroyed, permanent homes damaged, metal building siding damaged
11) 1153 pm	Franklin	1.8 S Branch - 2.4 NE Alix	18.5 mi*	2200 yd	170 mph	<b>3 killed, 16 injured</b> ; Considerable damage in the towns of Etna and Denning - See detail in article. Continued into Johnson Co.

\* Includes 1.9 miles in Logan County (WFO Little Rock forecast area)



The Etna/Denning tornado (Number 10 on map above) was rated EF-4 based on damage that occurred in and around Etna (located about 1 mile north of the intersection of Highways 288 and 23). Several well-built, wood-framed homes were severely damaged, one down to the foundation (Figure 1). The damage sustained to a well-built, steel framed home (Figure 2) between Etna and the Arkansas River was also considered to be low-end EF4. Some trees were debarked in the Etna area and the ground was considerably scoured by the debris generated by the tornado. The damage that occurred in Denning was rated EF-3 based on a severely damaged perma-

nent home and ten 100 foot metal power poles being bent over near the ground. Several other permanent homes were damaged (Figure 3) and mobile homes were also destroyed in the Denning area, much of which was rated in the EF-2 range. This tornado killed one person in Etna and injured at least six others. Two additional people were killed by the tornado in Denning with at least ten serious injuries also reported. All of the fatalities were mobile home related. ⚡

## Not Again!

On the heels of the recent strong La Niña in the Pacific Ocean, an encore may be underway. Observations of sea-surface temperature in the equatorial Pacific show that below normal temperatures have returned off the South American coast. Yes, La Niña has returned, and is forecast to strengthen and continue into the winter of 2011-2012.

Unfortunately, La Niña episodes tilt the odds in favor of below average winter precipitation over much of the southern United States...not the best news for drought-stricken areas Oklahoma and Arkansas.

The official winter outlook for the United States will be issued in October. ☀

## Summer Continued from page 2

So, where did we stand two-thirds of the way through summer, 2011? For the two month period of June and July, both Fort Smith and Tulsa eclipsed the record highest average temperature for the period. In fact, Fort Smith had already equaled or topped the century mark on 35 days through the end of July...already fifth place on the all-time list. The record stands at 54 days in 1954.

Rainfall was every bit as bleak. June 1 through July 31 of 2011 was the driest such period on record in Fort Smith, and the

fourth driest in Tulsa. The extreme heat and lack of rainfall caused drought conditions to worsen significantly. By August 3, the entire NWS Tulsa forecast area was in at least severe drought. Much of Pawnee, Creek and Okfuskee counties saw **exceptional** drought conditions, while extreme drought conditions spread over all but the far northern and southern areas of eastern Oklahoma, and into Sebastian and Crawford counties in Arkansas.

With August yet to come, this was already a summer to remember. ☀

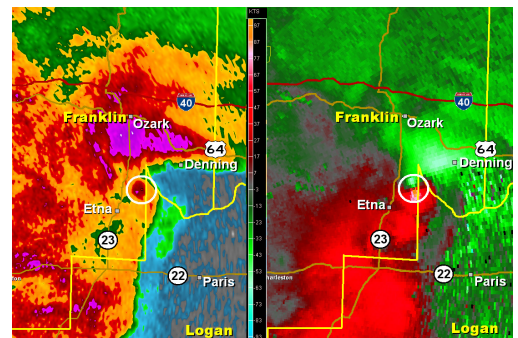
## Outbreaks (Continued from page 3)

### MAY 24 - DENNING / ETNA

A significant and deadly tornado outbreak occurred on May 24 as a powerful upper-level storm system moved into the central plains. As a dryline moved into western Oklahoma, the atmosphere became extremely unstable by late afternoon. The extreme instability was coupled with very strong (60-70 knot) deep layer wind shear. The conditions were becoming favorable for supercells capable of producing violent long-track tornadoes by late afternoon, and sure enough, severe thunderstorms rapidly developed along the dryline in western and central OK that afternoon and moved into eastern Oklahoma by early evening. A series of violent tornadoes occurred with the initial supercells west of Oklahoma City, including a deadly EF5 tornado on the north-western fringes of the metro area.

As the storms progressed into eastern Oklahoma early that evening, they lost some of their intensity, but still produced ten tornadoes. Several storms evolved into line segments, producing damaging straight-line winds. Several Oklahoma Mesonet sites measured wind speeds in excess of 65 mph. A spotter reported wind gusts to 100 mph 5 miles northwest of Hollow, OK in Craig County.

The storms ultimately moved into a more favorable environment over western Arkansas during the late night hours. A large EF4 tornado struck the Etna and Denning area of southeast Franklin County just before midnight, killing 3 people...one in Etna and another two southwest of Denning. A third victim died from her injuries some time later. All of the fatalities were mobile home related. ⚡



Reflectivity (left) and Storm-Relative Velocity (right) at 12:06 am, May 25, 2011. The white circle marks the location of the strong mesocyclone and probable tornado. A small area of enhanced reflectivity seen in the same area appears to be a "debris ball"...the radar is actually returning energy from airborne debris tossed by the wind. Near this location, a steel-framed house was severely damaged...enough for an EF-4 rating.

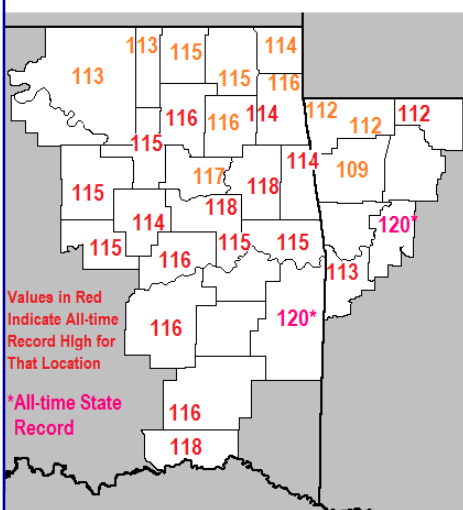
# One for the Ages...August, 1936 Heat Wave

*August, 2011 also featured an epic heat wave. How did it compare to 1936? Find out on page 11.*

While we have seen a lot of hot days this summer, in terms of magnitude and intensity, it will be hard to top the intense heat wave that gripped eastern Oklahoma and western Arkansas in August, 1936. That summer remains

one of the most brutally hot on record, reaching its peak intensity over the south from August 9th to the 11th, when high temperatures exceeded 110 degrees over virtually the entire area. A number of all-time record high temperatures were set on August 10, which still stand, including a whopping 120 degrees in Poiteau, OK, and in Ozark, AR...both all-time state record maximum temperatures.

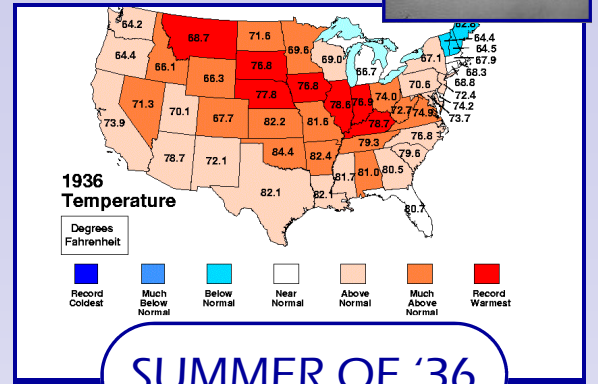
Observed High Temperatures August 10, 1936



The intense heat did not stop until the month was almost over. Tulsa reached 100 degrees or higher on 22 consecutive days from the 7th through the 28th, which remains the longest such string on record. Worse yet, the highs reached 105 or higher for 13 straight days and 110 or better for 6 straight days...remarkable since Tulsa reached 110 or higher only 10 times since..at least until this year! Fort

Smith did not fare much better, reaching 100 or higher 16 consecutive days from the 8th through the 23rd, the fourth longest such streak on record.

This came only a month after another extreme heat wave...one that impacted a significant portion of the United States and extended into southern Canada. At the time, the period of July 14-20, 1936 would have been the hottest week on record for the Tulsa area and close to it in Fort Smith. Temperatures reached as high as 113 degrees in Tulsa on the 18th and 19th, with temperatures reaching all-time records of 118 degrees in Tahlequah, 117 in Vinita and Pryor, 116 in Pawhuska on the 18th, and 114 at Okmulgee, OK and Gravette, AR on the 19th. 🌟



Oklahoma and Arkansas were by no means alone in the miserable summer of 1936...near the height of the "Dust Bowl" years. At its nationwide peak during July, 100 degree plus heat covered the Great Plains, Midwest, South, and much of the Northeast, as well as the provinces of Manitoba and Ontario, Canada. At times the heat even spread into the Pacific Northwest and western Canada. With air conditioning in its infancy, it was only available in some movie theaters, large department stores and other public places, and not in homes at all. Many people were forced to sleep in their yards or in parks when their homes became stifling.

About 5,000 people are estimated to have died from the effects of the heat in the U.S. during 1936, the majority of them during this heat wave. The death toll remains one of the highest of any weather disasters on record in the U.S. and in Canada. The heat was especially deadly in large Midwestern cities such as St. Louis, Minneapolis and Detroit. An estimated death toll of 780 is often mentioned for Canada. The July 1936 heat wave set all-time record highs in 12 states, two Canadian provinces and countless cities. 🌟

*For the second time in a month, torrential rainfall strikes northeast Oklahoma and northwest Arkansas*

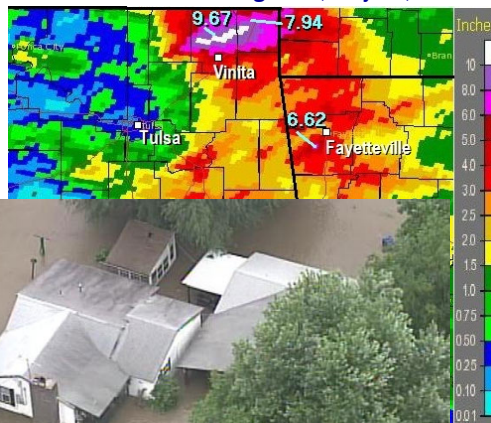
Lost in the shuffle of record extremes this year were a pair of significant flooding events: Easter weekend, and a flash flood event in late May. The latter was sandwiched between two tornado outbreaks (see pages 5 and 6) in a three-day period.

An outflow boundary from the severe storms of May 22 lingered across northeast Oklahoma and northwest Arkansas the next day. Training of thunderstorms along and north of the boundary led to very heavy rainfall and extreme flash flooding, with rainfall totals of 3 to 10 inches across Nowata, Craig and Ottawa counties in far northeastern Oklahoma. The storms eventually developed in a complex that moved through east central Oklahoma and west central Arkansas, producing widespread wind damage. A handful of homes suffered roof damage near Meg and Denning in Arkansas...an area that would be devastated by a tornado the following evening.

The mesonet site in Vinita, OK measured 7.48 inches of rain in only 5 hours! According to the USGS, the 0.2% annual chance, or 500-year, 6-hour rainfall for Vinita is approximately 7 inches. The Craig County Sher-

iff's Office reported that virtually all county roads north of Vinita were closed due to high water. Vinita Fire Department crews performed five high water rescues during the evening, rescuing a total of 10 to 15 people. In addition, 20 homes were evacuated in Vinita. In Ottawa County, four water rescues were performed, and many roads were either flooded or damaged. Two residences in a Miami housing addition were damaged by high water from Tar Creek. Roads remained flooded in these areas for several days.

#### 24 Hour Rainfall Ending 7 AM, May 24, 2011



Numerous homes in the Vinita, OK area, such as this one, were inundated by flood waters as nearly 10 inches of rain fell the morning of May 23.

Photo courtesy of KOTV.

Very heavy rain also occurred in northwest Arkansas. A one-hour rainfall total of 3.07 inches was measured at the Fayetteville airport between 3pm and 4pm. The Prairie Grove COOP observer measured 6.62 inches during the 24-hour period ending at 7am on May 24. Unfortunately,

ly, for the second time in a month, the flooding turned deadly...once again the deaths occurred in automobiles. Four were killed (2 women, a 5-year-old child, and a 2-month-old child) when, authorities believe, four feet of water washed their car into Butler Creek on Shinn Spring Road south of Gallatin, AR. The car was recovered in Butler Creek two days later, about a mile downstream.

The heavy rainfall led to another round of river flooding as well. Major flooding occurred along the Illinois River near Watts for the second time in a month, with the river cresting at 25.1 feet on the 24<sup>th</sup>. This was only about 3 feet lower than the record crest that occurred in late April, and the third highest crest on record. As the flood wave moved downstream, the Illinois River near Tahlequah also had major flooding, with a crest of 21.12 feet on the 25<sup>th</sup>. Two families in Fiddlers Bend were rescued by boat after the Illinois River crested there on the morning of the 24<sup>th</sup>.

Due to the heavy April rainfall, and the need to hold back water due to historic flooding on the Mississippi River, Beaver Lake remained less than a foot below the top of flood pool before the heavy rain. Although releases out of the dam had been increased on the 20<sup>th</sup>, the heavy rainfall on the 23<sup>rd</sup> in the White River Basin caused the lake to rise above the top of the flood pool the next day. Heavy releases from Beaver Dam once again caused flooding downstream along the White River to Table Rock Lake. ⚡

# August Relief Comes...at a Price

*A long awaited break in the extreme heat comes courtesy of destructive and, unfortunately, deadly severe thunderstorms.*

August began with upper level ridging remaining in control of the overall weather pattern across eastern Oklahoma and northwest Arkansas. Temperatures across the region approached, and in some cases, surpassed, all-time record high temperatures on the first through the third, and again on the fifth. Parts of the area finally saw their first significant rainfall in several weeks during the afternoon and evening of the sixth, as widespread thunderstorms developed across northeast Oklahoma and far northwest Arkansas ahead of a quasi-stationary front that was draped just north of the Kansas and Missouri borders. Rainfall amounts were generally in the 0.5 to

1.5 inch range...a nice start but nowhere near enough.

While the rain was welcome, afternoon highs still soared to near 110 degrees on the fifth, providing a favorable environment for damaging downbursts as the storms intensified in the early evening. Severe thunderstorms caused wind damage across portions of the Tulsa metro area, forcing the cancellation of an outdoor music festival. Jenks Riverside Airport measured a 63 mph gust when the storms moved through the area. Worse yet, many were left without power across the Tulsa metro for most of the next day as temperatures again topped 100 degrees.

By August 8, a long-awaited shift in the upper air pattern...albeit a subtle and temporary one...finally saw the upper level ridge weaken and shift west, leading to a northwest flow aloft. This helped finally push the aforementioned quasi-stationary boundary south and also opened the door for a series of thunderstorm

complexes to move through the area during the following days. Unfortunately again, the hot atmosphere provided fuel for another round of damaging winds.

Thunderstorms developed in north central Oklahoma along the front during the afternoon and evening of the eighth, then spread across northeast Oklahoma and northwest Arkansas. All areas except far southeast Oklahoma saw at least some rain from these storms, with maximum amounts ranging from 1 to 3 inches. The storms again produced widespread severe winds and wind damage. The Oklahoma Mesonet site near Hectorville in far southern Tulsa County measured a 66 mph gust, while a barn was heavily damaged near Haskell in northwest Muskogee County...the same barn damaged by a tornado on May 24!

The worst of the severe storms occurred during the very early morning

**August** Continues on page 11

## An Unfortunate First

The powerful line of storms that moved across northeast Oklahoma and northwest Arkansas early in the morning of August 10 produced the first recorded August tornado fatality in the NWS Tulsa County Warning Area...and in the state of Oklahoma...since 1950. An elderly woman was killed when her double wide mobile home was destroyed about 5 miles southeast of Locust Grove, OK. Two nearby single wide mobile homes were heavily damaged (see photo), with two injuries reported.

Based on an NWS Tulsa storm survey, the tornado was rated an EF-2 with estimated wind speeds of 120 to 130 mph. Of course, August tornadoes are rare, and strong (EF-2 or EF-3) ones are nearly unheard of. This was only the fourth strong tornado in the NWS Tulsa County Warning Area since 1950. None have been recorded in northwest Arkansas in August.



This mobile home southeast of Locust Grove, OK shifted off its foundation...but may have been "pinned" to the ground by the two large trees that fell on it during the August 10 EF-2 tornado.

## Repeating History...Almost!

**T**he first six days of August this year were brutal, to be sure. But how did this year's heat wave stack up to the one in August, 1936? For comparison's sake, let's look at August 1-6 of 2011 versus August 8-13 of 1936...both were the peak of extreme heat in those respective summers.

The first six days of August, 2011, were the hottest six-day period on record in Fort Smith...so in terms of statistics, this was the worst

Statistics for August 1-6, 2011  
and August 8-13, 1936.

Tulsa, OK			
	Daily Mean	High	Low
2011	96.8	110.0	82.7
1936	97.5	113.3	81.7
Fort Smith, AR			
	Daily Mean	High	Low
2011	96.5	113.3	82.3
1936	93.2	106.7	79.8

heat wave in the city's history. This was, as we mentioned elsewhere, part of a 35 day string of high temperatures at or above 100 degrees. So this was indeed an unprecedented stretch of summer weather in Fort Smith...at least since records began in 1882. The 1936 heat wave also was outdone in 1943 and 1954, with hotter daytime highs experienced in 2000 and 1986.

For Tulsa, the August 1936 heat wave still wins out. Only in terms of average daily minimum temperature did this year top 1936. The all-time record actually ended up being from July 31 to August 5 of this year. The temperature fell to 75 degrees before midnight on the 6th...this after a morning low of 88 degrees, which would have been an all-time record high daily minimum (Tulsa tied the old record of 87 degrees on the 2nd).

And, speaking of what might have been, consider the temperature trends at Tulsa International Airport on August 3. A light southwest wind persisted through the night, a perfect set-up for the "urban heat island" effect, and at 5 am, the temperature was 92 degrees...at that point the low for the day. Since daily low temperatures usually occur at sunrise or slightly after, it looked as if Tulsa would, for the first time in history, see a low temperature above 90 degrees! But, an outflow boundary from thunderstorms in Kansas pushed through shortly after, shifting the winds to the north and dropped the temperature to 82 degrees by 7 am. Later that afternoon, a cold front lurked north of the city, while the temperature soared, reaching 113 degrees before the front arrived. Had the front not arrived during the afternoon, the all-time record high of 115 might have fallen as well. I'm sure no one was disappointed! ☀

## August

(Continued from page 10)

hours of the August 10, when a complex of severe thunderstorms moved southward from Kansas and Nebraska. The good news...rainfall totals ranged from 2 to 4 inches, with highest totals along the Highway 412 corridor. The bad news...widespread severe weather occurred with this complex, with numerous reports of significant wind damage from northeast Oklahoma into northwest Arkansas between 1 AM and 6 AM.

Both the Tulsa and Fort Smith areas were hit hard, with several reports of structural damage. Six people suffered injuries as they rode the storm out in their mobile home near Slick, OK (Creek County). The mobile home rolled five times before coming to a rest, with two people ejected from the mobile home. As the storms pushed east of Tulsa, a double-wide mobile home near Locust Grove was destroyed, while two single-wide units were severely damaged. An elderly woman in the double-wide was killed, and two people were injured in one of the single-wide units. An NWS survey concluded the damage was the result of an EF-2 tornado.

The upside of the suddenly active weather pattern was a brief respite from the brutal heat at the beginning of August. High temperatures on the 11th finally fell below 100 degrees over the entire forecast area for the first time in a long time...and the record streak of 100 degree days finally ended in Fort Smith with a high of "only" 98 degrees on August 9, and a seemingly cool 90 degrees on the 11th. Of course the heat would return soon enough, but at least for a few days, residents of eastern Oklahoma and northwest Arkansas enjoyed "normal" summer temperatures...and the grass even turned green again in some places. In a year like this...you take what you can get! ☀